

Plane Talk

APRIL • 1943



THE LIBERATOR EXPRESS

Our Job is Building Airpower *by Tom M. Girdler*

Bombing the Japs at Kiska . . . *by Lieutenant Nelson M. Drake*

Plane Talk

PUBLISHED BY CONSOLIDATED VULTEE AIRCRAFT CORPORATION

CONTENTS • APRIL, 1943



Front Cover

The Liberator Express

This plane, in volume production on mechanized assembly lines at Consolidated Vultee in Fort Worth, has a loaded weight (including crew, gas, cargo) of around 28 tons. For news of its use in our global war, read "To India's Coral Strand".



Back Cover

Liberator Bomber over Grand Canyon

The Liberator bomber, like the Express, has a possible range in excess of 4000 miles. For a pilot's own story of a bombing expedition, read what Lieutenant Nelson H. Drake has to tell in "Bombing the Japs at Kiska."

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Edited by Hill and Knowlton for the Consolidated Vultee Aircraft Corporation. All text and pictures have been cleared for publication with Government authorities. Text may be reprinted with or without credit to Plane Talk. Copies of most pictures can be made available to editors upon request. While manuscripts are not solicited, first hand accounts of experiences by men in the air forces at the fronts will be given careful consideration. All correspondence in regard to articles, pictures, and Post Office changes of address should be addressed to Hill and Knowlton, 350 Fifth Avenue, New York.

Our Job Is Building Airpower

by Tom M. Girdler

WE now begin to see how victory is to be won.

At the end of this year we shall have an air force approaching 2,500,000 officers and men—over a hundred times larger than five years ago, and by all odds the world's largest.

To provide these men with planes, we shall have well over a million workers engaged in the aircraft industry, compared with a total of less than fifty thousand when Germany invaded Poland. The aircraft industry in value of output is now greater than the automobile industry ever was in its heyday.

The personnel figures show our airforce being multiplied more than a hundred times while the number of aircraft workers expands about 24 times, or less than a fourth as much. This reflects some of our progress. By mechanizing our aircraft plants and introducing mass production techniques, we are enabling a given number of workers to turn out many more planes than a few years ago.

In building Consolidated Liberators, for instance, we cut the man hours required per ship by two-thirds in less than a year.

Our country's average production of around 4,000 planes a month last year is being largely increased under current schedules. Contrast this with the fact that when we entered the war just 350 medium sized aircraft served our whole domestic airline system, and we have another measure of growth. We are already turning out more planes than all our enemies combined.

We are making them more powerful. While unit production of planes last year

was being doubled, the horsepower of engines was tripled, and tonnage was quadrupled.

This is just the beginning of our progress. For example, Consolidated Vultee now has planned, to the point where they could be put into production, planes that will dwarf even the largest of the planes now in service.

When victory is won, we shall still need a margin of airpower to assure that peace will be maintained. This means a vital post-war task for our industry. An airforce that does not renew its planes every five years becomes obsolete. Hence our orders for military airplanes after this war may be expected to remain important.

In addition, we may expect unique developments in post-war transport for civilians. We shall have perhaps 200,000 trained pilots; many more mechanics trained for maintenance; a world dotted with American made airports; manufacturing organizations prepared to service planes everywhere.

Further, there should be a large market for the family plane among the trained pilots the war has developed. The cost of operating small planes had already dropped from around \$25 an hour to \$3, when the present war started, and excellent light planes could be had for a price comparable to a moderately priced automobile. Under superior volume production methods, future costs should be still lower.

In preparing for this future our united organization has just one goal: to help in the work of keeping our nation great, by building airpower for victory and for peace.



Tom Girdler arriving in Fort Worth.

Tom Girdler speaks here as Chairman of the Board of the Consolidated Vultee Aircraft Corporation, created in March of 1943 when the stockholders of Consolidated Aircraft and Vultee Aircraft voted to unite their companies.

Plane Talk now combines two periodicals—the Vultair magazine and the Consolidator monthly—as a medium for reporting on the work of Consolidated Vultee in helping build American air power. Its first issue is in your hands.



BOY MEETS GIRL

ON THE CORONADO ASSEMBLY LINE

A war of machines, of experts,
of cold scientific skills, they predicted.
But today grandmothers and
housewives and old men and folks
who were never before
in a factory have acquired
the skills and the science,
are building
America's victory.

SURE! IT'S THE *People's* WAR



IN San Diego there's one school in a great building left over from the San Diego exposition—another in a church—another even in a once-vacant store room. They're crammed with students the like of which has never been seen before.

Two grandmothers, one white haired, the other pink-cheeked and marcelled, bend together with compass and rulers over adjoining desks. They are both learning to be mechanical draftsmen, to turn out their

share of the ten acres of blue prints required to build a single flying battleship.

"How on earth," you ask the Consolidated Vultee teacher, "do you manage to guess that a grandmother can learn some engineering, when she decides she wants to help in the war?"

"It's not so difficult at that," you are told. "First we look for evidence of artistic talent. Perhaps a woman has done painting, or drawing, or fine arts design. Per-

haps she laid a career aside to bring up a family. If she can draw, and if she is intelligent, we can easily teach her mechanical draftsmanship. She is straight on her way into the engineering department."

IN California, where the airframe industry of the nation centers, literally hundreds of thousands of people have gone to school, and are today at work doing precision jobs. Most of them were never before in a factory.

In an age that has been called revolu-

tionary, here we have the real revolution.

The lure of war-time money is not enough to have done this. In San Diego, for instance, Consolidated early realized that the sort of workers needed must be appealed to on the basis of their patriotic willingness to serve.

San Diego is a crowded city. Housing is at a premium. To bring in more outside workers would only complicate the lives of those already there. Thus appeals are addressed to the wives, mothers, daughters, in families already sufficiently sup-

plied with income. "Come and help us; if you don't need the wages you can still buy war bonds." That is the essence of the message. More are still needed.

BUT how, one may ask, is it possible to take completely green workers and teach them quickly to do precision work?

Walk into any one of the many schools, and watch. Here, at one table, you will see women busy with hack saws and pieces of metal — just learning to saw straight. Over there, at another table, you will see others learning to bore holes. Still others are learning to insert rivets—they put in rivets and rivets and rivets, over and over again. All these practiced-upon materials are carefully saved for the scrap pile; even the rivets are extracted and re-used.

There are precious machines in this classroom, too—loaned from the production line at the plant, so that embryo workers can learn to run them. Students mastering machine operations must take turns — there are never quite enough machines to go around.

Some of these schools run at night as well as day. The old and the young—and even some who are partial invalids—go straight from these classes to the production line.

The schools in San Diego are typical of those that now dot all California and many other parts of the nation. As an example of cooperation between government and industry, they are significant. Federal and State educational funds are used to maintain the physical facilities and administration. Instructors are experts usually taken direct from the aircraft production lines. Consolidated Vultee plants have loaned hundreds of employees to teach in community schools in nearby towns, from coast to coast.

The student who goes through one of these industrial training courses satisfactorily is practically assured in advance of a job. He need only walk into the employment office carrying evidence of his citizenship. He will be on the production line even before his fingerprints have been sent on to Washington—as they always are, by the plant protection service.

No matter how short the period of training, its graduate will enter Consolidated Vultee equipped for a special job. This results from the close coordination between the training schools and the methods used



Remember when folks past forty were supposed to be out of the running? Today they are a force in the aircraft industry, are welcomed for industrial training.

by production management. When managers were faced with the necessity of stepping up aircraft production overnight, and training thousands of workers to do it, they completely reorganized the production processes. Part of their work consisted of job simplification. In some cases, marvelously complex jobs were broken down into 15 or 20 different operations. This permitted training a new worker to become an expert at just one of these operations, in a short time.

TODAY most of the students, of course, are women. Those who first took the training undoubtedly looked on their venture as an experiment. But those days are over; the new woman trainee who works at San Diego discovers that 41 per cent of the other workers are women, likewise. She discovers that the work is interesting, even if routine, and that management has gone out of its way to make things pleasant for her.

If she has an embarrassingly personal question to ask, for instance, she need not go to a foreman; she can turn to the matron who assists him. Even the attractive uniform she wears received official attention when it was designed. If she uses a machine at her job, it has been studied and perhaps modified to make its operation suitable to her strength.

News of such management attitudes spreads quickly in a community, helps account for the steady flow into schooling of women who might otherwise be reluctant.



Tube bending is explained to three students in San Diego's Balboa Park School. Hundreds of feet of such tubing go into bombers — for example, see picture on page 18.

A CITY where citizens have responded to the need as in San Diego must eventually reach a saturation point in available workers. Foreseeing that day, Consolidated Vultee created small "feeder plants" up and down California, bringing work to people in their own communities. Training schools are established in small towns, and so far as possible the graduates are put to work nearby their homes.

Expansion of Consolidated Vultee work

in other states has also helped to distribute the load widely.

Whether in San Diego or Downey — Nashville or Fort Worth — Allentown or Miami — New Orleans or Tucson — the goal of all education for Consolidated Vultee work has been the same — to give new workers specialized skills in the shortest possible time.

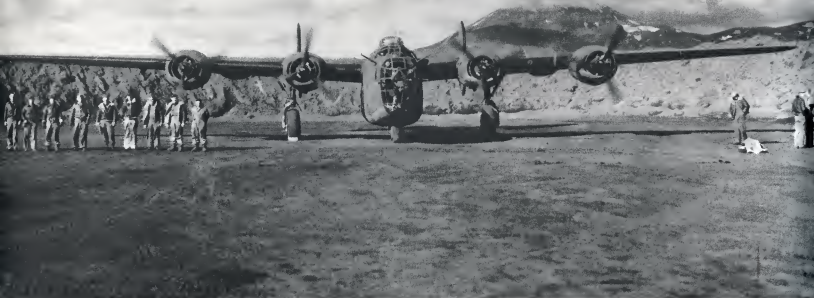
Training of recruits in the industrial schools is supplemented by further schooling after they have gone on the job. Every employee is constantly urged to develop higher skills by taking "up-grading" courses offered by the Educational Department. Still other courses are given selected workers for developing them into junior executives.

Recruits who can offer specialized skills obtained in previous work are often given a specialized training. At the new Allentown plant, for instance, men with engineering backgrounds in industries like construction and building are offered training designed to make them into aircraft engineers.

In such ways are amateurs learning to build the machine that is the climax of all our science, the airplane. This is an aspect of today's revolution that could not have been predicted. But it is one of the surest signs that this is really the people's war, and that the people intend to win.



Lathe operations being studied by a new group of students taking the machine shop course. Machines like lathes are precious — the girls will take turns using this one.



"Kiska Sal" and her crew in the far north, where clouds hang heavy most of the year, and bombing is done at 50 feet.

Lieutenant Drake has been co-pilot on Liberator raids attacking the Japs at Kiska, and sinking Jap ships approaching America's North Pacific shores.

He is a New Yorker, 28 years old, the son of Frederic Drake, publisher of Harper's Bazaar.

Bombing the Japs

AFTER awhile it grew lighter; I could see the leadship plainly. No need now for the planes to fly so close. I pulled away a little. Then Mac took the controls. I could light a cigarette, loosen my safety, relax. My palms were wet and I rubbed them on the knee of my trousers.

We were headed for Kiska.

We were going to "pattern-bomb" Kiska at low altitude. You play watch-the-leader when you pattern bomb. He opens his bomb-bay door; you open yours. He drops his bombs; you drop yours. The leadship's bombardier aims for all the other planes in the formation.

You're careful with your fuses in low bombing. You delay the explosion of the

demolition bombs, to give your plane a chance to get away. Otherwise you'd be blown out of the air. With fire bombs it doesn't matter. Our formation of Liberators had both on board. We were going in at 50 feet. Less if we had to.

OUR CREW—McWilliam's crew—had been operating Flying Fortresses. Then three crews from our outfit were transferred to Liberators. Our crew was one of those chosen. We liked the idea. We had to go back to the mainland for taking lessons. That first day we made mistakes. Once when we landed, we must have bounced twenty feet in the air. I thought we'd cracked the landing gear. It was terrific.

Then after a couple more landings, we got pretty good. Next morning we loaded our Liberator with men, suitcases, supplies, and headed back west. "Kiska Sal" roared down the runway, got us back home in four hours and a half.

Below us, as we made our landing approach, lay our "advanced Aleutian base," tents dotted with occasional round top huts and wooden buildings. Our own settlement of bomber men is fortunate in living quarters. We're housed in quonset huts. A poker game was going on in the far end of our hut as we entered.

The gang grouped around us, waiting to collect their cigarettes, candy, books, we'd brought.

"Say, Mac," said pilot Hetrick opening some mail we brought, "Have you checked tomorrow's schedule yet?"

"Hell no. Am I flying?"

"You're flying all right. Kiska. Briefing is at 6 A.M."

"HEY DRAKE, snap out of it," Mac nudged. "There's Kiska!"

I sat up, tightened my safety belt. Ahead the sun broke through overhanging clouds on a snow-capped volcano. We had come

close to the water. The engines roared.

"Lower, men, lower," said Mac quietly. It's harder for the enemy to see you when you're low. Now we were almost on the tops of the waves. Whiss! We were spotted. About a half mile ahead great geysers of water sprang up. The Japs were firing.

Lower we flew, ten feet maybe, twenty at the most. Straight through the harbor. Tracers from the bluffs came from either side. Tracers from the Jap ships ahead whizzed by our nose.

Our own guns spat and rattled in reply. Vibration from our top turret cracked the glass in my side window.

The bomb-bay doors of the leadship opened.

"Bomb-bay doors opened," I yelled. All the other ships opened theirs. The formation tightened, evened up their wing tips. . . . This pattern must be good. The closer we flew, the more concentrated our bombing. I glued my eyes to the belly of the leadship—its bombs would drop any sec-

ond now. Ahead I could see the camp area. Now docks, warehouses, barracks, mess halls, tents, were almost beneath us.

"Bombs!" I screamed, as the leader's charges began to drop. But our bombardier had seen them first. Even as I yelled I could see the explosions beneath us, feel the heat of the fire bombs pouring up through the opened bomb doors. A sea of smoky flame began spreading, flowing over all the target. It seemed bombs had dropped everywhere. Every ship in the formation had unloaded at once. The delayed explosion began behind us. The noise was incredible.

"Bombs away," said the bombardier over the interphone. He slowly closed our doors. We were flying low through a valley toward the other side of the island to turn eastward, head home.

We settled back in our seats, turned on the radio. WJZ, with a jazz band. Still morning in Alaska. Music for tea dancing from New York.



Quonset huts make snug housing in the Aleutians.

Interior of hut. Note sleeping bags and pot stove.



at Kiska

by Lieutenant Nelson H. Drake



Three 500-pound demolition bombs to be loaded.

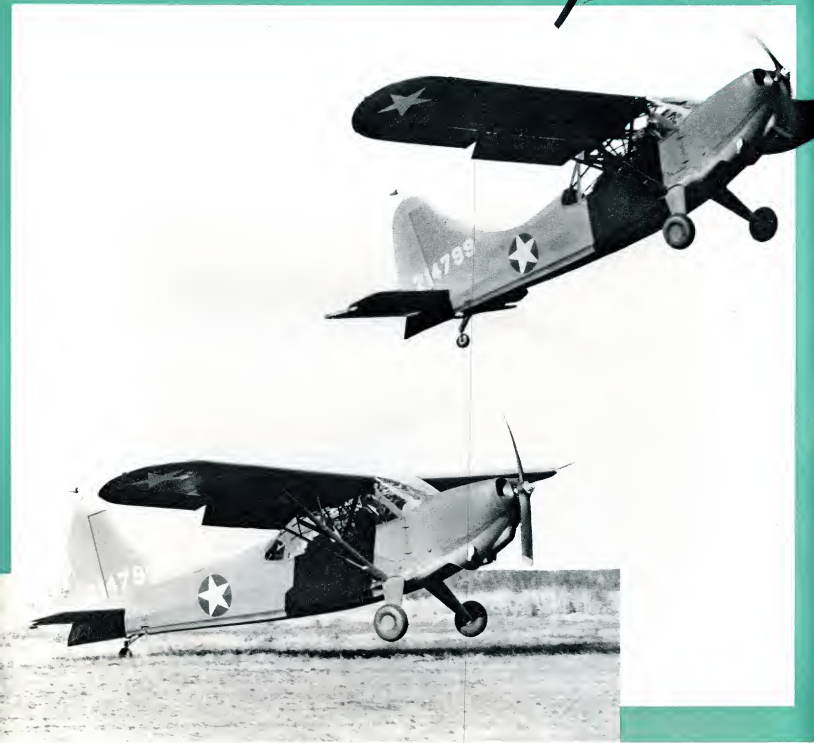
The author reports to Scotty, the squadron's pet.



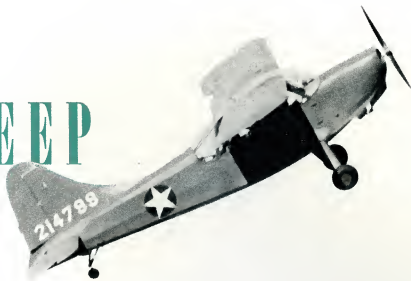
Recently released picture of Liberator bomber showing tail and turret guns.

The new Sentinel, called the Flying Jeep,
can almost leap into the air,
has the versatility of the ground jeep in action.
It can take off from nowhere, needs little servicing,
consumes a minimum of gas, is altogether
the sort of plane many a young fellow would like to have
in his own garage — someday.

Flying



JEEP



NOW coming into the hands of the Army is a new plane called the Sentinel or Flying Jeep, produced by Consolidated Vultee's Stinson Division to do a significantly specialized job. It illustrates how far aircraft engineering has come in developing ability to create a plane to meet a carefully defined need.

In the memory of millions now living, the engineering problem was originally just to create a plane that would fly at all. Then emphasis was put on safety—on developing designs that would take undue risk out of flying. Nowadays flying hazards are overwhelmingly based on human and not mechanical factors. Today, the engineer is free to concentrate most of his interest on creating planes that will act in pre-determined ways to meet given aviation requirements.

THE Sentinel is an illustration. The need has been for a plane that could act as the eyes of the ground troops. It would have to go anywhere they could go—hence it would require the ability to take off from almost any kind of ground. Further, it would have to take off after a very short run, climb rapidly at a sharp angle. For open clearings in wild country are often scarce, and are surrounded with many hazards.

Further, such a plane should be fast, yet be able to maintain flight at very slow speeds, so that it could hover in the air over an objective to be observed. It would thus perform the work of an observation balloon, with the advantage of making a quick getaway and avoiding becoming a fixed target for enemy fire.

The L-5 Sentinel (L is the Army designation for Liaison plane) was born to meet such exacting specifications. Carrying a pilot and an observer, it is packed with radio equipment that gives two-way communication with ground troops and other planes. It is designed for unusual stability in the air, so that the pilot can concentrate on observation without fearing inadvertent stalls or spins.

It can spot targets for ground troops, or spy out enemy action and give immediate

report. It can direct artillery fire while hovering at only 45 miles an hour, then soar away at an unusually fast speed.

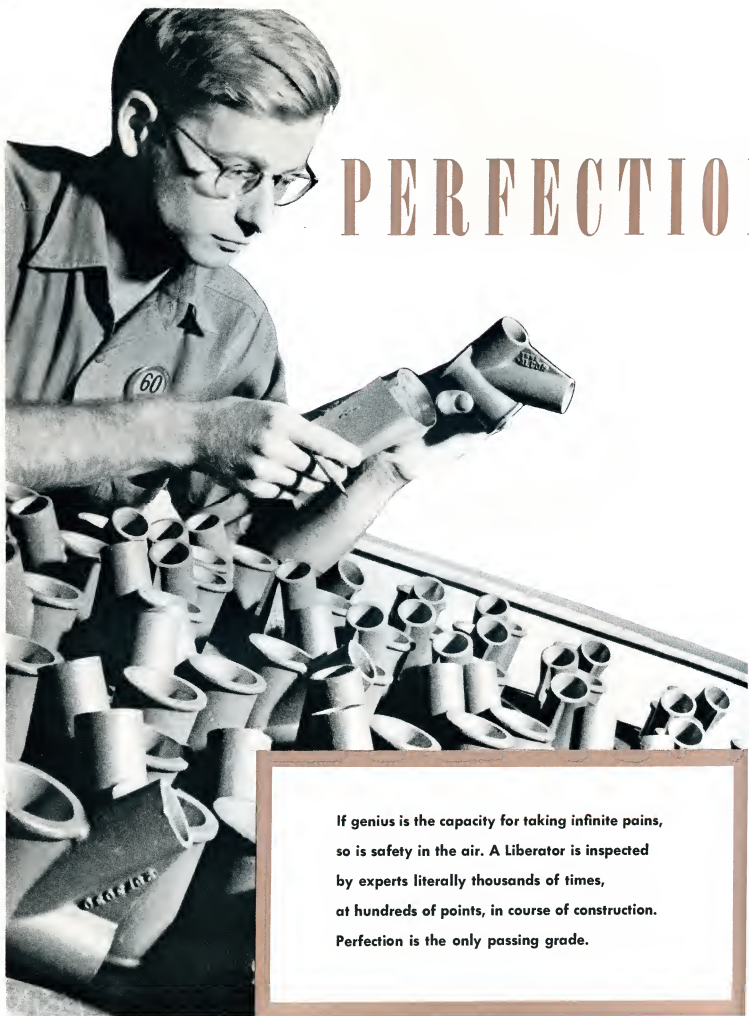
In exposed country, it can be easily pushed around by its crew and hidden under trees, just like the auto jeep. Its small 34-ft. wing span, being one-third less than that of the Stinson L-1, pioneer plane of this type, gives it access to small glades for shelter. Its 190 horsepower Lycoming engine is also smaller than that used in the L-1, and requires comparatively little gasoline or service work. This is important on distant battle fronts. Skis can be mounted on the plane's landing gear, for use in snow. It will carry a loaded stretcher, so that it can rescue wounded men fallen far from their lines.

EVEN in construction, the Stinson Flying Jeep is built to meet prescribed conditions. In a period when metals of almost all kinds are precious, almost 70 percent of the aluminum that would ordinarily have been used was eliminated. Wings and tail surfaces are of wood.

As evidence of the skill with which manufacturers can now produce specialized aircraft to order, the Flying Jeep will suggest numerous post-war possibilities to those following aviation developments.

In opposite columns you see the Stinson Jeep at three consecutive moments, as it takes off and climbs. Here you observe it from another angle, climbing almost vertically upward after a short take-off run.





PERFECTION

If genius is the capacity for taking infinite pains,
so is safety in the air. A Liberator is inspected
by experts literally thousands of times,
at hundreds of points, in course of construction.
Perfection is the only passing grade.



double checked

IF just one expert had the job of inspecting all the vital points in a battleship of the air, it might take him about three months. That battleship has around 102,000 parts, not counting rivets, nuts and bolts. Every one of them must be examined; and the whole ship, when finally ready for action, must still be gone over inch by inch again, before it may wing into its element.

There are no service men for roadside stops in the skies.

In one single Liberator factory, over 1500 trained inspectors focus unfaltering eyes on the production process. Each man, heavy with responsibility, holds life in his hands.

A special lingo has been developed on the inspection line, and inspectors' talk can often sound as much like Greek, to the ears of an untutored listener, as does the chant of the tobacco auctioneer.

When a given airplane part has been through the inspection mill and found perfect, for instance, the inspector says, like as not, "I'll buy it," then stamps his Okay on the "Traveller," a card attached to the part as it moves on its way.

Here is the way the foreman of the welders at Vultee Field might talk about inspection to a new man in his department:

"We don't want any Joe McGees here," the foreman—otherwise called puddle pusher—might say. "You gotta be on the beam or they won't buy your stuff on the drag line. Every time some shoemaker drops his stinger and arcs a tube, it means another rod burner has to spend an hour pickin' up the butch or it hits the squawk sheet."

If the new arrival had brought an interpreter, he might arrive at the following rough translation:

"We don't want any careless workmen here. You must be accurate or your work won't be passed on the final inspection line. Every time some clumsy workman drops his electrode holder and burns a hole in the tubing, it means another welder has to spend an hour correcting the fault, or it will be listed on the complaint sheet."

As such instructions would indicate, the job of building perfection into Liberators starts not with the inspector, but right at the beginning of parts fabrication. Every worker, every leadman and foreman, is trained to guard against faulty workmanship and error.

How are inspection experts developed, with qualifications for the exacting work? Here is Don De Marce speaking, Chief of Inspection in the Consolidated Vultee plants at San Diego:

"Once we demanded aircraft experience in our inspectors, plenty of it. But with production for war, we had to go outside the aircraft field for people we could train. We looked for workers with at least one to three years' college work in engineering, or graduates of an intensive school. Out of 1100 we trained, about 20 per cent failed. Each student was taught one or two jobs, no more. In this way we made specialists

Final check-up of a Liberator Express, preparatory to its test flight, in the yard at Fort Worth.



on thousands of aircraft installations."

All Consolidated Vultee inspectors, checking up on workmen, in turn are followed by a corps of Army and Navy inspectors, who "spot check" previous inspection work on every plane, before accepting delivery in the name of the Air Forces.

NO PHASE of inspection is "most important." An airplane, like a chain, can be no stronger than its weakest link.

As the sheets of dural metal, the raw materials, the parts built by subcontractors, come in on the receiving platforms, Receiving Inspection gives them their original third degree. When the sheet metal department turns raw material into some plane parts, inspection must write another "Sold" before they can move further. Indeed, these parts are not "buttoned up" — joined permanently — until the Inspector has given his Okay; this avoids any need of tearing a plane apart again to correct an error.

When the sub-assemblies are made part of the airplane on the final assembly line, actual written records, called "clean-up sheets" in the inspection book, accompany the plane on its way. After a worker at a given station puts in a hydraulic connection, or installs a motor bracket, he signs the sheet to show the job was done. Then the inspector checks it, adding his stamp.

Thus each installation and thousands of joinings all have a recorded history that is filed for future reference when the completed ship moves off the line.

Even now inspection isn't finished. In the Field Operations area, you will see signs warning off everyone, even employees who do not have specific passes to enter.

Here a complete over-all check of the finished airplane, including operational ground check of engines, is made. And again, before the ship is flown into service, it gets a final pre-flight and safety check inspection of operating mechanisms.

This system of assuring perfected perfection in all Consolidated Vultee ships helps account for the fact that today's air accidents are in almost every instance to be attributed to human factors, not mechanical failure.

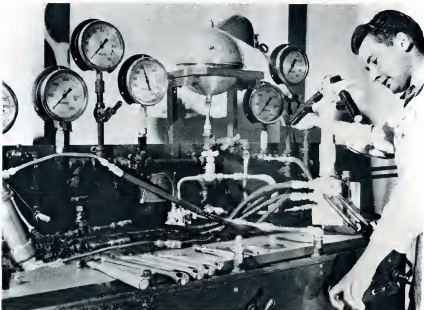
It is the human factor that the Training command of our Air Force concentrates on seeking to eliminate as a cause of failure. The problem is to make men as faultless under stress as men now make machines.



Women inspecting small parts for Liberators wear "I" on their sleeves.



Each of the 102,000 parts is inspected by trained experts several times.



Testing control valves under flying conditions; controls must be perfect.

**"Vengeance Dive Bombers are now in active combat
on what we must call the Shangri-la front,
causing destruction of enemy fortifications and replacements."**

*G. M. Williams, Assistant to the Chairman of the Board,
Consolidated Vultee Aircraft Corporation.*



V...—Also Means Vengeance



Part of the Vengeance assembly line at the Consolidated Vultee Nashville Division.

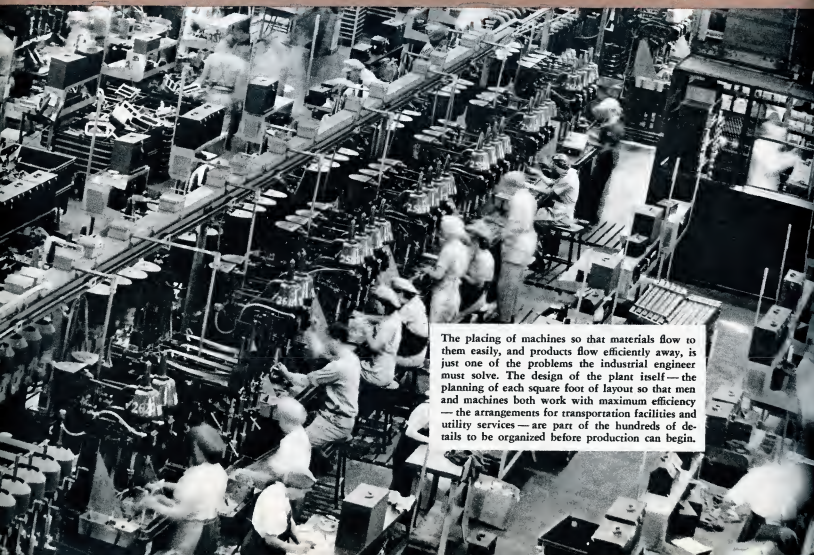
THE dive bomber, always a specialized weapon, was an American origination. But the Germans made it famous. Only now, after comparatively late recognition, are United Nation fronts beginning to get dive bombers in quantity.

The dive bomber, just because it performs a special job, will seldom be in the news month in and out. It will be there when strategy demands the weapon—as, for instance, in completing the dislocation of retreating land forces.

The Vengeance is a savage weapon, a two-seater plane equipped with 1600 h.p. Wright "Double Cyclone" engine, and carrying a capacity load of 2,000 pounds. It is in volume production on mechanical assembly lines at Nashville, Tennessee.



GOOD PLANNING is the Production Secret



The placing of machines so that materials flow to them easily, and products flow efficiently away, is just one of the problems the industrial engineer must solve. The design of the plant itself—the planning of each square foot of layout so that men and machines both work with maximum efficiency—the arrangements for transportation facilities and utility services—are part of the hundreds of details to be organized before production can begin.

AN INTERVIEW WITH

A. J. Brandt



THE Government banded Consolidated a rush order to open a plant in New Orleans and produce \$40,000,000 worth of patrol bombers there for the Navy. Vultee got an order to equip an \$11,000,000 plant immediately in Allentown, Pennsylvania, and start on a \$100,000,000 contract for Navy Torpedo bombers.

The planning and design of the plants for this work will largely determine the efficiency and speed of the production that follows. A. J. Brandt is one of the first men to go out on the job and start the new assignment. Mr. Brandt is Senior Partner of his own engineering firm in Detroit, in addition to being a Director of Consolidated Vultee Aircraft Corp. and Special Engineering Consultant to Tom M. Girdler.

WHEN you ask A. J. Brandt what he considers most fundamental in factory design to achieve volume production, he will probably speak to you of movement.

"Manufacturing" he says, "must be considered as the movement of materials. True, the materials change form; one piece is added to another; finally the assembly is complete. But movement is the underlying essential that links the whole process.

"Now, the oftener you pick up a piece of material and lay it down, the more the product costs. For each handling takes time, labor and facilities.

"This means we should eliminate the use of stockrooms, wherever possible. To store raw material, drawing it out to perform a

few operations, and then storing the processed part again until assembly, is wasteful. It makes for extra operations. It can be avoided by keeping material and parts on the move from one department's operations to another's, until finally assembled. Wherever possible, parts and sub-assemblies should be moved direct to the final assembly line."

This is the principle followed in assembling the Liberator. At various stations along the final assembly line are "bays", where the parts to be installed on a plane at that particular station are delivered immediately upon fabrication. They are kept here until they can be added to the plane in the minimum number of hours.

Simplifying the work is another essential of good planning. Says Mr. Brandt:

"We must simplify the processing, so that workers are made responsible for mastering only one or two operations. The length of time needed to train them, and to get into full production, is thus materially reduced. Proper planning will enable you to draw an organization chart to show just what personnel are required at the proper time at each station, and the training they need to do the job there.

"To make what we call a 'true' layout of the factory, small scale models of the various parts and assemblies are used, to show the proper relation of floor space required in each department. These departments are so located, with reference to each

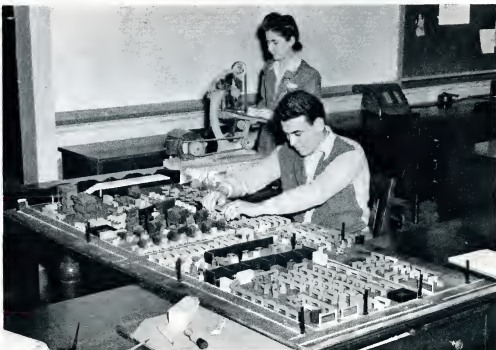
other, that a minimum of travel is required to get a part or sub-assembly from one operation to the next one. After the departments are laid out in this way, the architect can design a building to cover the operations. Sometimes, of course, the layout must be juggled to fit existing buildings. But the principles of good planning still apply."

THE planning of an aircraft factory for low-cost high quality production actually starts as soon as the preliminary design of a plane is completed, and planning for production starts. It is at this point that the production and tooling engineers look over the models and drawings, and determine just how the various parts should be designed to make for ease in manufacture and assembly.

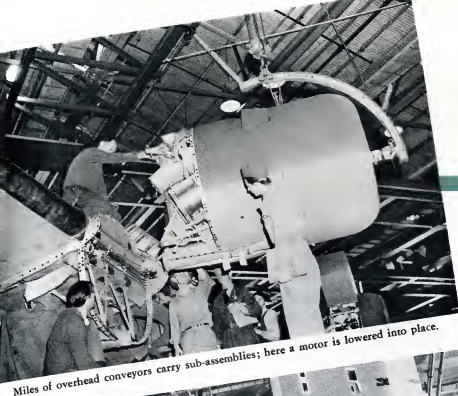
"Proper study at this time," says Mr. Brandt, "will eliminate more man-hours in the factory than you can achieve in any other way. One such study reduced the man-hours on one important assembly for Liberator bombers to only 17 percent of the time required by the old method.

"In such factory planning lies the secret of much of the success attained in building superb planes in mass production. All of this planning, however, is dependent on the daring and ingenuity of the plane designers. For their work is the keystone of any and all success the planes will have in tactical use."

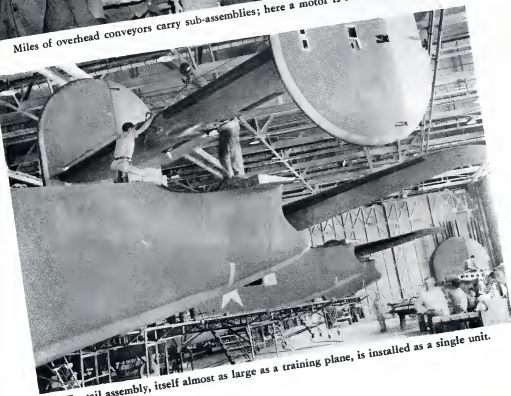
Exact scale reproductions of equipment in use at Consolidated Vultee to determine planning.



Putting 17 Ton



Miles of overhead conveyors carry sub-assemblies; here a motor is lowered into place.



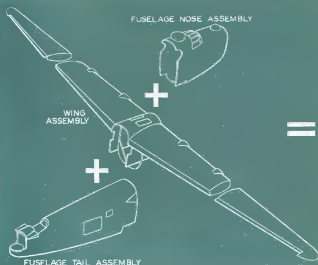
The tail assembly, itself almost as large as a training plane, is installed as a single unit.

WHILE the seventeen-ton Liberator is only a small indication of giant planes to come, it is still the largest bomber in volume production in the United States today. Its assembly on mechanized lines confounded experts who said it couldn't be done. The mechanization is a triumph of planning. For tooling and industrial engineers first had to break down highly complicated operations, calling for highly skilled craftsmen, into small, simple jobs which could be done by green hands.

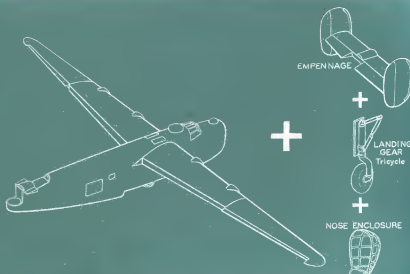
Vultee first solved the problem of making small jobs out of big ones, saving years in the learning period. But Vultee established no precedent for conveyor lines for great bombers. Vultee was making only small planes, slightly larger than autos.

Here is how Harry Woodhead, Consolidated Vultee President, has described the problem of mechanizing bomber production:

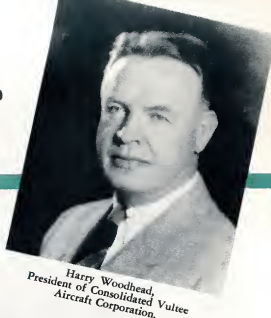
"When we undertook volume-production in airplane building, two courses of action were possible. First, we could have kept on with the old custom building system—merely enlarging it, pulling more workers into more floor space, and increasing equipment, all in direct proportion to the number of airplanes we wanted to



=



s of Science Together



Harry Woodhead,
President of Consolidated Vultee
Aircraft Corporation.

build. Or—second—we could revolutionize the old production system; plan our factory layout to eliminate lost motion of men and to speed up flow of materials; increase use of tools and machinery; cut down man-hours per unit. We chose this latter course.

"Here are the results. In the nine months ending January, 1943, there has been an increase of just about 10 percent in the number of workers at San Diego. But—we are now able to produce 2.3 planes for every one plane we produced in April. During the whole of 1942, man-hours needed to produce the Liberator were reduced more than 60 percent."

The final assembly line at the San Diego plant, typical for Consolidated Vultee operations, illustrates how some of these results were achieved.

This line is really an oval track, on which partly finished planes travel the whole length of the assembly plant and back again, as the work is completed.

No labor is done on this final assembly line that can be done previously. All the main sections of the Liberator are fabricated in advance, as "sub-assemblies", before they ever reach the final line. The fuselage, for instance, is made up in two

parts, called the "fuselage tail assembly" and the "fuselage nose assembly." The first step on the final assembly line is to bring these two sub-assemblies together with the center wing section.

FIRST to be mounted on the track is the center wing section, lifted there by an overhead crane. The next step in construction is to fit a "jig" over this. The jig is simply a metal form, made of pipe, used to hold parts in rigid and exact position while being assembled. If, as a child, your picture was taken by a photographer who put your head in a vise while you watched the birdie, you have had some personal jig experience.

With the wing in place, and fixed in the mating jig, the nose and tail sections are now put in the positions in which they will be riveted.

The mating jig stays with the developing plane until, riding on a carriage, it reaches the third "station" on the line—a station being merely a point where prescribed work is done. Planes on this assembly line do not move forward steadily, as on a belt. Instead, they pause at each station for a certain period, after which the line moves on again.

By the time the plane has reached the

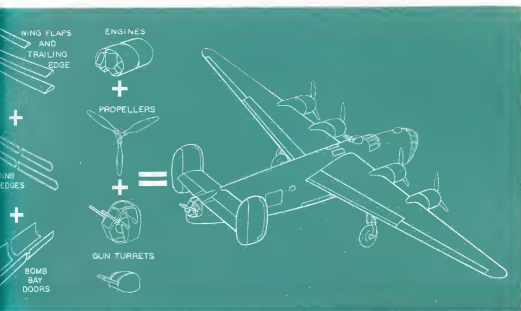
third station, there have been added bomb-bay side panels, bomb-racks, cat-walk and bulk-head segments, and upper decks over the wings.

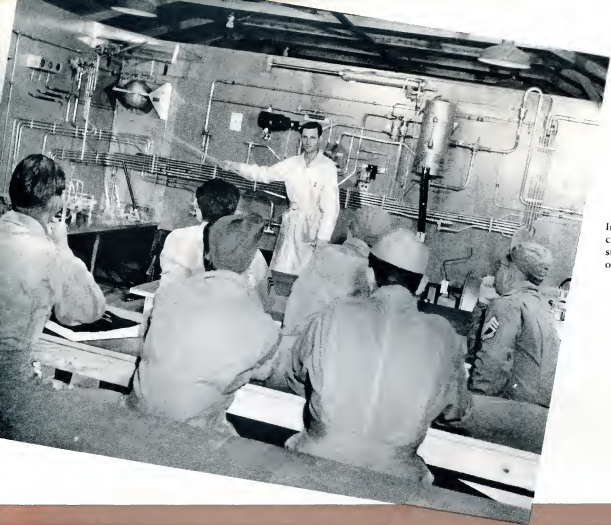
It travels on, accumulating tail surfaces and other parts; swings onto the second half of the line, where engines, outer wing panels, stabilizers and rudders are installed. By the time the outer wing sections have been added—some visitors have been heard to refer to these as "wing tips"—the new plane has the enormous wing spread of over a hundred feet. It does not take up this much breadth on the line, because it is placed there at an angle of 45°. By travelling in a diagonal position, considerable space is saved.

Most of the sections mated on the final assembly line are themselves extraordinarily complex assemblies, on which thousands of man-hours of work have been performed on sub-assembly lines.

The size of the problem encountered when these sections get together for a permanent mating can be realized when you learn that each Liberator bomber contains approximately 102,000 separate parts, not counting 85,000 nuts and bolts, and 400,000 rivets. In the final assembly all wires, tubes, hydraulic control pipes, must be accurately hitched on to corresponding mates in other sections of the ship, just as a brakeman connects steam pipes when railroad cars have been switched together.

So well organized is the whole process that Liberators flow off the line one after the other. Flexibility of the Consolidated Vultee methods, permitting adoption of needed modifications, can be seen from the fact that in the year of 1942 more than 200 changes in construction took place without interruption of the steady flow.





In this classroom the hydraulic and mechanical systems of a Liberator are stretched out along the walls; each inch of tubing can be dissected and studied.

Training Doctors for Wounded Bombers



Classes are divided into small groups for individualized instruction. Consolidated Vultee teachers specialize in one phase of plane construction.

Every time a Liberator bomber rolls off the assembly line, a scheduled number of spare parts go with it. To keep Liberators operating at top form, the Army Air Forces need skilled service men. Today, by the hundreds, they are being graduated by the AAF Technical Training Command to do the servicing. Such men, trained to work under all conditions all over the world, can — and must — take a Liberator apart and put it all together again. They learn how through their schooling at Camp Consair.



At Camp Consair meals are served on a 24-hour basis, for the school runs on a three shift schedule.

In war, bombers get hurt — sometimes badly. They need care, overhauling, constant regular inspection and adjustment to keep them sound for combat, ready for battle.

That takes men, experts in mechanics, craftsmen skilled to do a maintenance job under every conceivable condition.

Camp Consair — and others like it — help provide them. Here men selected because they have shown unusual aptitude, in basic mechanics, camps throughout the country, are turned into specialists on Liberators. Where the planes go, they go — under the AAF plan of a man for every motor.

These men come from every walk of life. The ex-butcher, baker or candlestick maker learns to take Liberators apart, to put them together again, and even — in an emergency — to improvise repair parts.

Consolidated officials provided the site for Camp Consair on San Diego bay, next to the company's plants. They put up the buildings; prepared a comprehensive text book — 400 pages of fact, figures and "how to do's"; set aside a number of Liberators for "classroom" use; created working "mock-ups" for close hand study and inspection. The instructors are all Consolidated Vultee experts, taken from production for the important job of making more experts.

Camp Consair, which opened May 17, 1942, operates under the direction of the

Air Force Technical Training Command, with Captain Jack Mason Lyons in charge. He and T. P. Faulconer, director of the Educational Division at Consolidated Vultee in San Diego, head a staff of more than 150 civilians and enlisted men looking after the needs of almost a thousand students.

The boys live, sleep, eat in wooden barracks — fifteen in all, plus mess and study halls, laboratory buildings, and officers' quarters. They work and study intensively eight hours a day, in close-knit groups of from five to ten. They complete their course in four weeks, 120 graduating under the rotating system every week.

School "keeps" 24 hours a day. Several groups are trained simultaneously; the camp is run on three shifts, just like the aircraft plant next door.

Learning to master the workings of a Liberator is an involved job. There are hydraulic and electric systems, miles of wiring, a complicated control system, fuel and oil lines, oxygen systems, de-icers and anti-icers, a whole maze of instruments built as fine as watches.

When the boys are graduated from Camp Consair they are ready to go to far reaches of the world. Some will work sweating in the 130 degrees of Egypt's dry heat; others in the dripping wetness of tropical jungles; still others in the breath-freezing cold of Alaska or Newfoundland.

Wherever they go, the lives of many good men will depend on their ability and judgment and training. The students at Camp Consair know this, and they are a hard-working and serious group of young men.



Field work supplements class-room training at Camp Consair. Liberators are the laboratory.

LET'S GO!





Liberator crew at San Diego, after a flight home from a freight-carrying trip to some Pacific goal.



Russell R. Rogers, who heads Consolidated's Flight and Service.

To India's Coral Strand

Loading a truck with oxygen cylinders and parachutes for delivery to a Liberator about to take off.



"From Greenland's Icy Mountains to India's Coral Strand", sang the old hymn. The crews of Liberator transport ships, in the Ferry Command service, are regularly carrying America's vital war shipments just as far, in a matter of hours.

YOU can't know all about it until the war ends. Spare motors loaded in Detroit today, in Greenland tomorrow. Plane parts and blood plasma in Australia after leaving America perhaps 36 hours before.

Pilots over some routes, such as certain parts of Africa, carry with them letters from the President of the United States, offering a ransom if they are forced down and captured by one of the violent native tribes. Over many of these routes there are no radio beams; map navigation is almost impossible because of the sameness of the territory; navigation by the sun is difficult, because of obscuring dust clouds. But the planes go and come, almost with the regularity of clocks. A Ferry Command Pilot was recently complaining bitterly in Washington that his laundry was in India and he couldn't recover it until his return the following week.

Express cars of the air now shoot through space at speeds over 200 miles an hour. (Soon it will be even faster.) They point straight as a die to destinations, leap all barriers of continents and oceans.

AT Consolidated Vultee in San Diego is a huge room crowded at all hours with pilots who are among the best long range flyers in the world. Some are just back from faraway islands and continents; reporting and turning in equipment. Others, soon to leave, study the flight schedules posted on the wall blackboard, check weather reports, swap news, pour over maps. This is the company's Flight and Service Department, headed by Pilot Russell R. Rogers as General Manager. He and his executive assistant, Richard McMakin, have seen their responsibilities grow almost overnight into those of a flight organization

reaching across a continent and an ocean.

Liberator Express planes, for instance, have for months maintained a regular schedule in a foreign service operated by Consolidated Vultee representatives for the Air Transport Command of the Army Air Forces. Other Liberators are in use on other transport routes that virtually span the earth. General George Catlett Marshall recently spoke of America's new routes through the air-ocean as follows:

"We are hooked up by air transport all over the world. It is difficult even for people in the War Department to see the picture as a whole. We are building major bases around the world. We have a tremendous installation in the Persian Gulf . . . bases along the shore of the Red Sea area . . . a double track across equatorial Africa . . . lookouts strung clear across the Himalayan passes."

Such thorough-going organization of our new air routes helps explain how it was possible for the President of the United States to fly 6000 miles to meet the Premier of Great Britain in Africa, as casually as Lincoln visited the Richmond front on horseback in the War between the States; or how a vital military hospital in Alaska, when burned to the ground, was replaced in just 36 hours with emergency facilities brought in by air.

In actual fighting, air transport is being used to carry men and weapons to locations that otherwise they might never reach in time to win a victory. In supplying our fighters with material, and in evacuating them when they are wounded, air transport is an arm reaching from almost every town in America into the depths of any desert and jungle our fighting men penetrate.

It is a new power for our Army, a new

A new Liberator Express, just off the Consolidated Vultee assembly line at Fort Worth, is loaded with cargo for its maiden voyage.





Navigators must be expert. A slight miscalculation could lose the plane in trans-ocean crossings.



A war correspondent travelling on a Liberator uses a crate as a typewriter desk, writes en route.



Taking a radio compass bearing, as here, is not always possible in areas without radio beams.

comfort for our people. As one columnist explained it, "Parents of boys fighting in North Africa will be pleased to learn that Army bombers and transports can fly wounded Yanks to Palm Beach in 15 hours."

While he wrote, another Palm Beach hotel was being converted into an Army hospital.

The ATC links our Government with our allies. An American official can leave our coast in the morning and dine in London that evening. It links our men to their families. V-mail passes back and forth in days, instead of months.

NONE of these elaborate transport routes is much over a year old. In the beginning, the whole undertaking had to be an improvisation. In the evacuation of Java, for instance, cargo and people were packed in the fuselages of Liberators where bombs are ordinarily carried.

Recognizing that the need for air transport would be almost unlimited, the Army ordered Consolidated's Fort Worth plant to devote a whole assembly line to producing a modified Liberator designed exclusively for transport service. This was the origin of the Liberator Express. The work was done without shortening the scheduled production of Liberator bombers in any way.

Further, to fill a gap, the Army Air Force took over many large planes from America's established commercial airlines, and also put into transport service any other available planes that could be suitably converted.

General Harold L. George of the Army Air Forces directs this transport operation, as head of the Air Transport Command.

Military personnel and trained civilians work side by side. It was found most practical, in setting up the new routes, to put their operation in the hands of the commercial airlines and of organizations like Consolidated Vultee, in order to utilize their experience to the full. The Air Transport Command is in charge of integrating and directing the operations of the whole. Some of the newly established routes are manned by Air Force personnel, others are flown by civilian pilots under AAF supervision.

In addition to operating or supervising its regular transport routes, the Air Transport Command is responsible for delivering new planes at the front. Such planes as Liberator bombers are sent out carrying, in place of bombs, a maximum load of material or passengers. This work is in charge of the Ferry Command of the ATC. Its members speak of "ferrying" planes over. There are even some women in the Ferry Command—an experimental unit of about 50 members, called the Woman's Auxiliary Ferrying Squadron.

THE work being done by this world-wide air transport is literally changing the course of world history. The greatest troop carrying air armada yet assembled by the United Nations flew "many thousands" of fighting men from England to North Africa, for the surprise attack there; it was a non-stop trip of some 1400 miles, carried out simultaneously with the arrival of the sea-borne troops. Due to the pioneer work of the air transports to Alaska, this vital theatre of operations can be serviced today and communications kept open to every point. The servicing by airline of our Army and Navy units in Midway is another story yet to be told. Captain Rickenbacker re-

cently revealed that Army and Navy transport groups now average 500 trans-Atlantic flights a week, "and more are being added all the time."

The Navy, like the Army, has found air transport an invaluable aid on all the fronts it guards. Consolidated Vultee makes for the Navy its own version of the Liberator, which the Navy calls the PB4Y-1, in addition to the Coronado flying boat, the PB2Y-3. Both of these models have been used by the Navy for transport purposes.

The work of our fighting forces necessarily gets the headlines. But when the war has ended, the routine and unheralded work of our Air Transport Command will be understood as one of the most extraordinary overnight developments of our age.



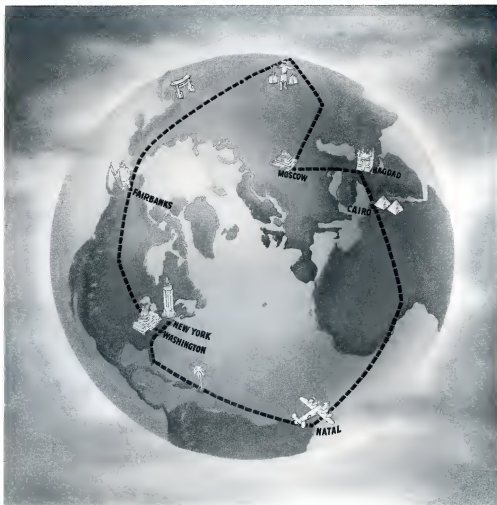
Parachutes in the Flight and Service department are stored in racks, high altitude suits nearby.

Flying Around the World in 6 Days

AFTER the war a trip like this is going to be quite practical for you and your family. (Aircraft experts say it will be fairly cheap, too, cost no more than the boat transportation of yesterday.)

You could start off from New York, touch at Washington and West Palm Beach; go on to Porto Rico; then go to Natal, Brazil; from there cross the Atlantic to Africa; look in on Accra, on the famed Gold Coast; cover other African points like Kano, Nigeria—Khartoum, in

the Anglo-Egyptian Sudan—Cairo, polyglot city of Egypt—Palestine and the Holy Land. From this point in the Near-East, a natural route back to America could go through Bagdad, Mesopotamia; Kubyshev, Moscow, and Tashkend, Russia; Urumchi, Hang Chow, and Chengtu, China; then through Outer Mongolia and Siberia to Fairbanks, Alaska; thence via Edmonton, Canada, and Minneapolis, Minnesota, back to Washington. Home again, you would have covered some 27,000 miles.



This is the exact trip which Wendell Willkie made in just six days and six hours of flying time, without counting stopovers, using a Liberator transport ship called "The Gulliver" by its crew.

Today's Liberator now makes up to 300 miles an hour; was used by Churchill for his trip to Moscow and more recently to meet President Roosevelt at Casablanca; and by General Arnold for his record-breaking trip from Australia; is often preferred for vital transport assignments. But after the war you yourself will be able to make the trip even faster—Consolidated Vultee has far bigger airplanes already planned.

The Greeks Had a Word for It: Amazons

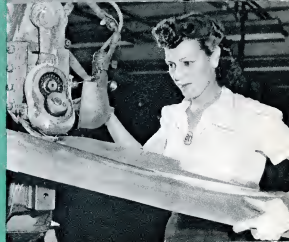
Harry Woodhead Suggests WICs for our own women warriors: Women's Industrial Corps

Here are 23 of the 40 women who pioneered at the San Diego Division two years ago by going into aircraft production work. Today the women employed in Consolidated Vultee plants are numbered by the thousands, and all are doing work that men once did. Tom M. Girdler predicts that 50 percent of the employees will be women soon.



This worker is using a portable electric drill, preparing for riveting. Notice gaps left between rivets already installed; these are closed gradually.

Women have the patience for intricate work required in the Liberator's electric nerve system. Relay boards, switch panels, and fuse boxes are part of it, are added in the electrical bench division.



This Vultee Field worker has claimed a world's record in cutting through 4,800 feet of aluminum in an 8-hour shift, with the circular shears machine.



The "Cats" Have Nine Lives

Catalina at Western Australia Base.

Official U. S. Navy Photo

The Catalina, one of the most versatile of the planes made by Consolidated Vultee Aircraft Corporation, is in the news almost constantly on our eastern and western fronts. It is being employed in two models — the PBV-5, which is a flying boat, and the PBV-5A, an amphibian plane with retractable landing gear that takes off either from land or water. Both our own Navy and our allies are using the Catalina as a patrol bomber. The Navy has just ordered \$30,000,-000 more of the amphibians.

by Edward Churchill

THE Catalina cruised steadily at 6,000 feet. It passed from the Pacific across the shoreline of an island. From its blister a figure, dark against a blue sky, shot downward. A parachute mushroomed, the man floated slowly toward earth. The Catalina droned onward into oblivion.

Let Corporal Keen, RAAF flight engineer, tell his story.

"The plane contained a crew of eight, and we were on patrol," he says. "We spotted a Jap cruiser. We radioed our position so the other boys could come out and knock her off. Then we began circling, watching our prey."

Keen doesn't know exactly what happened, except that "all hell broke loose." He has a faint recollection of six or seven Zeros attacking. He was knocked cold by concussion.

"When I came around," he relates, "I called the pilot on the inter-com. No answer. I left my station, staggered forward. I passed gunners, radio man, navigator. They were dead. One man was horribly mangled. Must have been hit with everything, including a cannon shell. In the pilots' cockpit I found both men dead.

Seven gone! Only I lived, and I didn't know how to fly the plane. It was on an even keel. The pilot, before dying, had turned on the robot pilot.

"I waited for land. Then I bailed. Natives picked me up about a week later."

Corporal Keen is now back with his squadron, flying again. No trace of the sturdy Catalina, final resting place for seven heroes, has been found.

"How that plane took it!" Keen says. "I think the Zeros gave it all the ammunition they had, ran short of gas and had to turn back, probably thinking that steel men were flying some strange, indestructible craft."

This is only one of the stories coming, with dramatic simplicity, from the airways of the Pacific. There is the saga of the PBV-5 fondly titled "Grand Dad" and still in service. It was bombed and shot at by the Japs at Manila. It was flown to Java and, mortally wounded, was abandoned there. A Dutchman with mechanical skill and the need of flight, patched it up. He flew it to Australia. It was completely overhauled, is still one of the most capable on the line.

SQUADRON Leader G.U. "Scotty" Allan. Pert, bird-like Scot, native of Lanarkshire, told about "Grand Dad" when he recently came from "down under" for a quick inspection trip at Consolidated Vultee's great plant in San Diego. "Scotty" is now mothering a brood of seaplanes, many of them famed Catalinas, and is training personnel. Where? How many? Exact duties? "Scotty" is bound not to tell.

"There was a night patrol," he relates, "and a 'Cat' bumped into some Zeros who poured shells into the port engine, cutting the oil lines. The motor quit. With one left, the pilot staggered 420 miles over the Pacific, landed in open sea. He found he was in enemy territory. He and his crew dumped a lot of oil from the starboard engine into the port so that it would be lubricated well enough for take-off. He had to have two engines to get off that rough water.

"He got off all right. Then, still in the dark, he flew 400 miles back to his base. Yes, the planes can take it. But the pilots need planes, and they'll do anything rather than lose one. They'll go to any lengths."

PLANES are always getting shot up by machine gun fire, anti-aircraft and anything else the Japs can hurl their way. "Scotty" tells about rubber plugs, wooden plugs and metal plates lined with rubber, which go up on every flight. You see, after a Catalina hull has been shot full of holes, it sinks when you land—unless you get desperate and plug the holes.

"The 'stoppers' are carried in a kit box about two feet long, one foot wide and one foot deep," Allan explains. "After you've bumped into the Nips, you start to work. If the hole is small, made by a machine gun bullet, and is jagged, you ream



Official U. S. Navy Photo

Beaching crew uses line to pull Catalina into landing position.

it out with the round end of a thing that looks like a tomahawk. Then you push in a rubber plug.

"It might be a cannon hole, about an inch and a half in diameter. In this case you'd use a wooden screw. We had plain wooden plugs at first, but now we have 'em with flanges. The water swells the wood and holds it tight in the hole.

"For the bigger stuff we use an inside plate with rubber around the edges, a smaller outside plate which we force through the tear. We tighten a dowel, pulling the two plates together. If there's a stringer in the way, we hack it out with the knife end of the tomahawk."

ALL this has to be done between the time the battle is over and the plane is landed. Sometimes, after being badly shot up, the boys are pretty busy. The whole crew pitches in.

There are times when the Catalinas have to come down on heavy seas, landing with a terrific bounce and wrench. Now and then a "back" gets twisted, which means that the area of the fuselage be-

tween the tail and the wing has buckled.

"The boys bring 'em in shored up with timber," Scotty says.

He'd like to tell more about the heroic exploits of the men who work with him. He says he'll do it after the war is over.

"It's teamwork, not starrating, that counts with the RAAF," he explains. "In fact, if a man gets his name in the paper he has to buy drinks for all the officers in the mess. Sometimes, with fifty or more, this runs right high."

There's a Scotch twinkle in his eyes when he tells that.

He learned to fly in 1917, flew in Egypt, left the service in 1918. He has flown commercial from 1920 to 1939, had 13,917 hours when he again enlisted.

"This war is tougher than the last," he says. "The Japs are shrewd, skilled pilots. There's some talk about them not being as good as they were at first. But we see no sign of it."

Australia's need?

"Planes, planes and more planes—from pursuits to flying boats, from cargo planes to bombers."

Passed by British censors, this photograph shows a Catalina being worked for Indian Ocean patrol work.

Wide World Photo

An R.A.F. gunner keeping "gun watch" in the blister of a Catalina, on duty in Atlantic seaplane patrol.

British Air Ministry

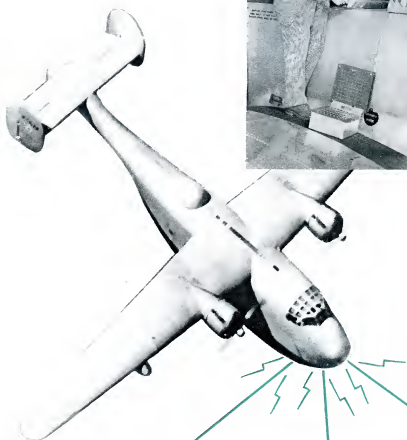
In Alaska a Navy ground crew up to armpits in ice-choked water guide a Catalina to its base ashore.

Press Association, Inc.



New Flight Recorder Never Lies!

BELOW: Consolidated Vultee P4Y Flying Boat, scheduled for early production at New Orleans for the Navy. RIGHT: Installing the aural unit of the Flight Recorder in a plane ready for its test flight.



WHEN planes moved at only 100 miles an hour, a test pilot taking a new plane into the air could at all times be pretty sure of what was happening. The report he made, when he reached the ground, was an accurate picture of the plane's performance.

But in today's powerful planes are embodied forces too great for the five senses of the human body to measure and record. The picture of the strains and flutters, characteristics, performance, and reactions in the new aircraft is too complex for the pilot's eyes, hands, ears and brain to note and transmit.

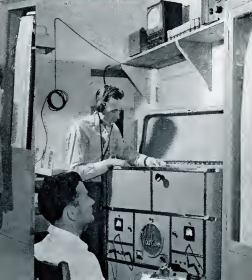
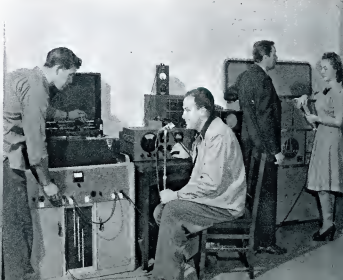
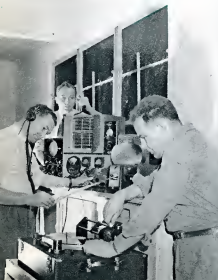
The automatic flight recorder, just perfected in the engineering laboratories at Vultee Field, now eliminates these hazards of human perception and judgment. It is a radio operated mechanism which, placed in an airplane, instantaneously transmits to laboratory crews on the ground a complete and accurate report on how every part of the plane is performing under the stresses of flight.

With this device in operation, the technicians below actually know more about the airplane's condition in test flight than does the pilot at the controls.

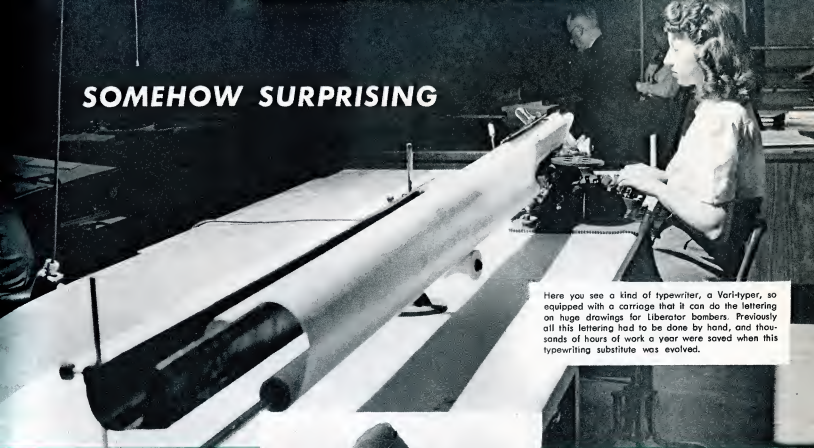
Flashed to earth by radio, the plane's reactions are picked up by the ground unit, recorded on tape, sound film and wax discs.

The new device permits the pilot to be merely a chauffeur for the plane, relieves him of responsibility for reporting the plane's reactions. Shown here, second from right, is Harvey Giffen, inventor of the device, with assistants at Vultee Field.

Sound records, run through this automatic analyzer, appear as graphic charts of reactions reported by each instrument and gauge.



SOMEHOW SURPRISING



Here you see a kind of typewriter, a Varl-typewriter, so equipped with a carriage that it can do the lettering on huge drawings for Liberator bombers. Previously all this lettering had to be done by hand, and thousands of hours of work a year were saved when this typewriting substitute was evolved.



These four hefty workers on the Liberator production line are all preachers, taking courses at a Fort Worth seminary and spending part of their spare time building air power to defeat our enemies. Left to right they are John Maddox, B. Lester Huff, William Usserv, J. D. McMurray.



Mrs. Elzada Brinkerhoff, shown in her new uniform of Vultee Field, has a lot of relatives in the services, including a husband who was taken prisoner by the Japs at Guam. When a Japanese shortwave broadcast came over the ether, purporting to carry an interview where the imprisoned Brinkerhoff said he was "having a fine time, with Geisha girls for entertainment," Mrs. Brinkerhoff got really mad at our enemies and went into uniform herself.



By telephone to Hawaii, Evelyn Daniels in Fort Worth got married by proxy to George M. Shoffner, aircraft engineer now stationed at Hawaii's Hickham Field. It's all legal, but a church wedding is to follow later in Honolulu. Meanwhile Evelyn is helping Consolidated Vultee build Liberator Expresses.



These things that look like pies coming out of a baker's oven are actually parts for Liberators, riding on a conveyor track that takes them through a paint sprayer. The mechanization that has been effected in Consolidated Vultee production is dramatized here by the small number of people at work in a vast room where thousands of parts are processed daily.

In one part of the Consolidated Vultee organization are folks who get paid for literally "lying down on their jobs." These are the workers in the Loft Department, trained artists and draftsmen, who lie on their stomachs, propel themselves on tiny scooters, while sketching designs on huge pieces of metal that make body sections for planes.



Not quite ice cream wagons, but almost, these carts carry iced rivets to the Liberator production line. Cold rivets contract. After installation they warm up and expand, making a tighter fit with greater holding power. These carts rush them, packed in dry ice, from the storage refrigerators to the rivet guns.

I was there

**Our press services and radio networks
are doing a job in this global war
that has never been equalled in war reporting before.
Correspondents take all the risks of soldiers
and airmen, without being armed themselves.
A number have been killed, wounded, or taken prisoner.**

**Here are some excerpts from recent news dispatches
telling just what a man feels and sees when
he rides a fighting plane aloft.**

HELL-HOLE IN THE PACIFIC

EDDIE RICKENBACKER SPEAKING:

In New Guinea I found our Air Force boys accomplishing the impossible—always doing too much with too little. Under abnormal conditions they were bringing down four and five planes for every fighter we lost. The heavy bomber Flying Fortresses and B-24 Liberators were bringing down from eight to ten enemy planes for every one we lost.

The boys on the ground in Buna and Gona—one of the hell-holes of the Pacific—were fighting in the jungle with its filth, vermin and mud, to say nothing of the Japs, diarrhea and malaria.

Our Air Force boys were transporting reinforcements, supplies, ammunition, cannon, rations and evacuating the wounded. It was the only form of transportation available.



Press Association
Liberator crew in "Mae West" belts for Wake Island raid.

Here is a thought for the engineering fraternity in all branches of production of war supplies and material.

With this war certain to last two years or possibly more, and our transport planes becoming larger and larger, everything that is needed for the troops—artillery, automobiles, tractors, bulldozers—should be designed with one thought in mind: of making them simple to disassemble and reassemble so they may be transported by air. It is an absolute necessity.

Returning to Australia and then through the Fijis to Guadalcanal, I arrived in this hell-hole as the rainy season was starting.

Henderson Field runway is a metal strip that has been bombed and shelled for months, and it is also the airplane graveyard of the Pacific, not only for enemy planes but our own as well.

Dugouts were filled with mud and water. Men were working in jumpers without shoes or socks. Marines and soldiers in the fox-

holes with billions of mosquitoes. Malaria was prevalent, as was diarrhea.

Here you will find a Catholic priest, a Protestant preacher, or a Jewish rabbi, all preaching the simple faith to Catholics, Protestants and Jews alike.

Oh, men and women of America, if you could only understand what our boys—you boys and mine—are doing in these hell-holes throughout the Pacific and the burning sands of Africa, that your way of life may be preserved, and the character that has made this nation great may be carried on, you would not worry about eight hours a day overtime, or double-time for Saturdays and holidays.

—Captain Eddie Rickenbacker, quoted by the United Press.



Wide World Photo
Aussies groom veteran Liberator in Mediterranean area.

ARMADA IN THE MEDITERRANEAN

GRANT PARR SPEAKING:

When we hit Navarino Bay we were several miles above our target, breathing oxygen to keep from suffocating in the thin air, and wearing heavy wool and leather flying suits to keep from freezing in the subzero temperature.

The target spread out below us like the colored relief maps that had been handed out several hours earlier in the briefing room. There were our two transports, moored almost together at the east side of the harbor. We were coming in to bomb them so I went up to the pilot's cabin to watch our nine-ship formation release its bombs. We already were flying on our bomb run.

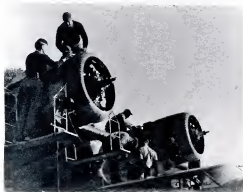
Just ahead and below us was another Liberator with "Alice the Goon" lettered on her nose. On our left the third ship of our group was recognizable by some fingers painted on the nose in an emphatic, if vulgar, gesture. On our own bomber was the picture of a train that apparently once ran from Natchez to Mobile and from Memphis to St. Joe.

I crouched in a niche just behind the forward cabin, hanging to two handles and leaning out over the open bomb bay. It was deathly cold, but I was too excited to notice it.

With a slight jolt our bombs fell away, seemingly far wide of their mark. Then momentum and wind drift whipped them in toward the transports like a fast curve breaking over the edge of the plate.

Bombs from "Alice the Goon" burst off to the left. The blast bumped our plane, way up there. Bombardier Gardiner estimated that our

(continued on page 32)



Official U. S. Navy Photo
Catalina based in Western Australia getting overhauled.

On the Fighting Fronts



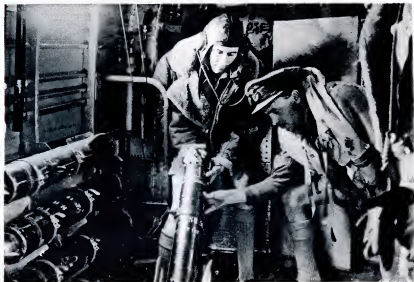
British Air Ministry Photo

Winston Churchill in the Middle East, after landing from his Liberator bomber, shown in the background.



British Air Ministry Photo

R.A.F. beam gunners, in position on a Liberator in British service over the Middle East.



British Air Ministry Photo

R.A.F. Liberator crew in Mediterranean operations release a flare through the flare chute.



Press Association, Inc.

Operational flight in North Africa: Liberator formation seen from the nose of the bombardier's compartment, winging to the target.

Back safely at base after meeting the enemy. Liberator scorred by shell fire.
Press Association, Inc.





British Air Ministry Photo
R.A.F. crew bringing up bombs to Liberator in England.

(continued from page 30)

own bombs, which fell in a semicircle around the ships, were as close as seventy-five feet, near enough to bash in the sides.

The men in the third element, which followed us in, saw smoke coming from one vessel and observed our near misses.

In a surprisingly short time the job was over. The next thing was to get home.

We were circling over the rocky mountains of Greece, waiting for the last formation to catch up, when we were attacked by fighter planes.

There were three of them, two Messerschmitt-109's and a Macchi-202.

A Messerschmitt attacked the Witch, the rear ship in the formation, and sent his bullets into the tail and wings of the big Liberator. One bullet went into the gas tank. An explosive shell blew up inside a wing. A slug went through the rear turret. One bullet ripped through three duraluminum braces. Another pierced two braces and went through a tubular steel gun mount.

All this bothered neither the Witch nor her crew. The pilot, Lieutenant Glade Jorgensen of Utah, phoned back to ask if any one had been hurt. "Yes," replied Gunner Frost, "but we got him."

He was right. The Messerschmitt had taken more than it gave. All the Witch's gunners kept firing, despite their wounds, and the gunners of the two other ships in the element were pumping lead into the doomed German. He bailed out of his diving plane but his parachute did not open.

The Macchi pilot was more careful. He slid down from above, raking the Witch as he skidded by. When he ended the manoeuvre he was almost in the middle, and slightly below, our nine-ship armada. He never had a chance. The guns of my plane opened up. The leading element opened up, too. Gunners from the Witch's group were still firing. The Axis fighter spun down, out of control, and the pilot parachuted into the sea.

The third enemy fighter peeled off and that was the last we saw of Axis planes.

Now it was only a flying job of getting back home through the clouds and darkness over several hundred miles of water.

As we flew over Greece I wondered as I saw little white towns nestling in the hills, what misery their tiny roofs concealed. Could the Greeks see the white star on the blue field that marked our wings? Did it give them hope that help was on the way?

—Grant Parr in a wireless dispatch to the N. Y. Times.

OUT FROM ENGLAND

EDWARD MURROW SPEAKING:

The other day some one said "there's plenty of action in the Bay of Biscay these days," so I decided to fly down and see.

There were nine of us; seven boys wearing the RAF blue, a big four-motored Liberator Bomber from San Diego, and myself. It was a routine patrol coastal command, one of the dozens of planes that fan out from this island every day, sweeping thousands of miles of ocean, looking for U-boats, covering convoys, and checking the weather.

The people who make these planes ought to be proud of their handiwork. Yesterday a Liberator took on five German fighters over the Bay, shot down two of them, and then came home again.

In the early morning light our Liberator stood on its own parking place, a kind of concrete frying pan with the handle attached to the main runway. As I straightened up inside the plane with my feet still on the concrete, my head hit something hard. The flight engineer standing beside me said "Careful—that's a depth charge." There were several of them on each side of a narrow catwalk, hanging there like milk cans in the old barn. We scrambled up to the flight deck and the bomb doors rolled to beneath us, just like one of those roller top desks, and the little Cockney wireless operator jerked a thumb in the direction of a parachute and a Mae West life jacket and he said "These are your ones—just in case." Someone else handed me a little packet of concentrated food with the remark that it should be kept in the pocket—just in case.

The red-headed flying officer at the controls checked his instruments, eased the throttles forward and the Liberator began to roll. I looked aft and saw the flight engineer leaning against the depth charges—combing his hair. When I turned my head we were air-borne, the green and brown fields of England slipping away beneath us.

Soon we were over a cold, gray sea, looking like a huge gray blanket covered with chips of marble. George, the automatic pilot, was put to work and we flew a steady course. Far ahead there was the smoke of a coastal convoy. The sergeant pilot reached up and pulled the trigger of a big pistol fixed in the roof. There was a hollow "plop" and a colored ball of light burst in the sky above us. The destroyer escorting the convoy winked an answering light signal, and we soon left the convoy, each ship towing its barrage balloon behind.



J. N. S. Photo
Navigator on Coronado, naval "battleship of the air."

There was a glimpse of Land's End as the gunner in the upper turret turned on the power and swung around in a circle behind his two machine guns. The turret was made in Baltimore. Communications with the tail turret and the side gunners were tested while the engines from Hartford pulled the Liberator, with its belly full of depth charges, down towards the center of the Bay of Biscay. I saw a submarine off to the port, needing along on the surface. The flight engineer leaned over and remarked "That's no way to travel these days." She was a British submarine. I crawled back between the cans of dynamite for a talk with the tail gunner. But he was too cold to talk. The after part of the aircraft seemed filled with machine gun ammunition, flares, smoke floats and life rafts. I went back to the flight deck for lunch—sandwiches, a boiled egg and an orange, plus plenty of hot coffee. It was the first real orange I'd seen for many months. But the men who fly that patrol can have mine any time. They earn them.

The wireless operator scribbled a message, handed it up to the pilot, and clamped the earphones on his head again. I wondered how



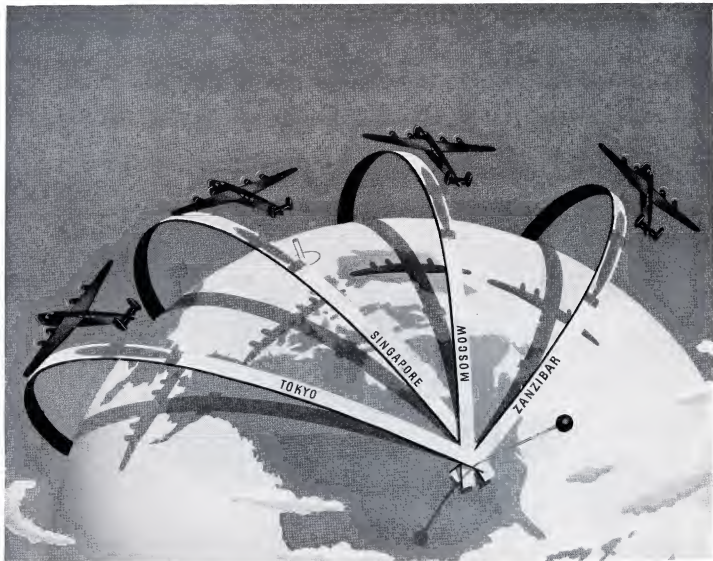
British Air Ministry Photo
Catalina at Gibraltar, ready for R.A.F. U-boat patrol.

many people were flying through the air at that very moment, ready to drop things on other people. This flight is very comfortable compared with these long night hauls to Italy. The bombing of Genoa and Turin must be mighty good news in Abyssinia. I hope the natives out there, who haven't forgotten the Italian bombing of helpless villages, get to hear of those four-thousand-pound bombs cascading down on Italian cities.

I said to the pilot "Let's go on to Gibraltar." He shook his head and told me he was down there a couple of weeks ago—"very nice it was, too, plenty of sunshine." But he'd really like to take his Liberator down to North Africa, thinks there must be good hunting off that coast now.

Finally we turned for home, heading back toward the island U-boats are trying to starve, and I began to think about what we'll do with all these thousands of bombers when the war is over. Some day, if that Liberator lives, it may be carrying food and clothing and medicine to Warsaw or Belgrade or Rotterdam. Huge cans of concentrated food may replace these depth charges hanging in the bomb bay. People on the continent may learn to listen to the drone of those four motors with hope and confidence instead of fear.

—Edward Murrow, speaking from London over the Columbia Broadcasting System.



No Spot on Earth is more than 60 Hours from Your Local Airport

ALONG with all that's being said and written about the kind of world we'll be living in after the war, here's one fact you cannot ignore: "No spot on earth, however distant, is more than 60 hours' flying time from your local airport!" That's how small the world is today, because of the plane.



MERCATOR PROJECTION

If a Liberator bomber, built in San Diego, were crated and shipped the 9240 miles to Algiers by sea, it would arrive about a month later.



POLAR EXTRATROPICAL EQUIDISTANT PROJECTION

A Liberator bomber is capable of flying the 6210-mile airline route from San Diego to Algiers in about 31 hours' flying time.

Or look at one of the new "aviation geography" maps, like those our

children are studying in school. These maps make obsolete the maps we have always known. They show us the world as it really is. In this world, because of the plane, Main Street runs from your home town to London, Moscow, and Chungking. Nations and people we once thought remote are now merely hours and minutes away.

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From El Paso, Texas, to San Antonio, Texas, is 617 miles—an 18-hour trip by train.

The airline route from New York to London is 3460 miles—a 17-hour flight,

such planes are being designed. The Air Age has come, sooner than we thought. Already we have had to learn that wars must be won with the aid of the new Air-Age geography—not in spite of it. And we are beginning to see that the peace we win must be built on a clear understanding of this new global geography and how it can work for us.

AIR-AGE TIME TABLE

FROM	TO	AIRLINE MILES	HOURS
New York	Berlin	3966	20
Chicago	Singapore	9265	47
New York	Cape Town	7061	39
San Francisco	Wellington	6758	34
Washington	Moscow	4883	24
London	Rome	687	4½
New York	London	3460	17
London	Berlin	574	3

Today, of course, the global skyways are reserved for war. But after the war, when freedom of the air returns, trade and travel by plane will become as much a part of everyday life as the use of cars, trucks, buses, railroads, and ocean liners. It is no dream of the future to count on global transportation in giant planes which fly almost with the speed of sound itself. Even today,

such planes are being designed.

The Air Age has come, sooner than we thought. Already we have had to learn that wars must be won with the aid of the new Air-Age geography—not in spite of it. And we are beginning to see that the peace we win must be built on a clear understanding of this new global geography and how it can work for us.

The tens of thousands of men and women who make up the U.S. aircraft industry believe that America must be supreme in the air—to win the war today, to win the peace tomorrow.

They know that air power alone will not win the war. But they find it difficult to imagine a nation which possesses the finest planes, and the most planes, going down to defeat.

CONSOLIDATED VULTEE AIRCRAFT CORPORATION

San Diego, Cal. • Vulture Field, Cal.
Fort Worth, Texas • New Orleans, La.
Nashville, Tenn. • Wayne, Mich.
Allentown, Pa. • Tucson, Ariz.
Elizabeth City, N. C. • Louisville, Ky.
Miami, Fla.

Member, Aircraft War Production Council



LIBERATOR OVER GRAND CANYON